From the Author.

ON

LITERARY AND SCIENTIFIC PURSUITS,

AS

CONDUCIVE TO LONGEVITY,

WITH

EXPLANATORY NOTES.

BY

RICHARD FOWLER, F.R.S.

Nam cætera neque temporum sunt, neque ætatum omnium, neque locorum: at hæc studia adolescentiam alunt, senectutem oblectant, secundas res ornant, adversis perfugium ac solatium præbent; delectant domi, non impediunt foris; pernoctant nobiscum, peregrinantur, rusticantur.—*Cicero's Orations.*

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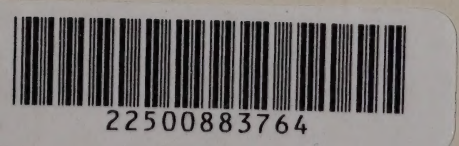

PREFACE.

In addition to a few explanatory Notes, I have reprinted some Abstracts of former Papers read at the Meetings of the British Association, on Physiological subjects referable to the Thinking Process.

ON LITERARY PURSUITS,

&c.

WHILE young and amusing myself with translating and re-translating some passages in Cicero, my attention was much arrested by the following, in his essay *De Senectute*, "*Manent ingenia senibus, modo permaneant studia et industria.*" My past experience has satisfied me as to the certainty of the fact. But it has not been till lately that I have been able to find a physiological explanation of it. All the functions of the mind are affected by corresponding functions of the body, and it is by the circulation in the minute arteries of our organs of brain, senses, &c., that they are kept in a sensitive and active state.* Any one who has attended blood-letting must have observed that the stream is accelerated by any exciting thoughts, and blushing is attributable to a like acceleration. So, too, is the inflamed appearance of the features expressive of anger. But our conceptions, also, are vivid in proportion to the

* See page 17.

accelerated flow of blood through the brain, medulla oblongata, and organs of sense. Now, there is not only an accelerated flow of blood in the brain while we are thinking, inducing more vivid conceptions, but there is a re-transmission from such conceptions to the functional parts appropriated to act in accordance with such conception. The sufficient ratio for this process seems to be to keep all sound parts of our organs in a state of functional efficiency, and to repair such as are unsound. Of this the restoration of Cretins to sense and health, by rational treatment of body and mind, supplies a satisfactory example. To ensure such uninterrupted recurrence of hopeful conceptions as may retransmit a continued supply of pure blood to all the structures of the body employed in thinking, pure air, water, and exercise are essential. I cannot but attribute the continuance of my own faculties mainly to frequent washing the whole surface of my head, neck, and face with cold water, yellow soap, and a large nail brush. By this all the sentient extremities of the fifth pair of nerves are kept free from pressure by the imbibition of water, revivified by the arteries accom-

panying them, and thus a direct and free communication is kept up between the brain and all the organs of sense, so that our observations may be made with accuracy, and result in clear and abiding conceptions. Conceptions will constitute the materials of some hopeful purpose,* and furnish occupations to the mind, and be a resource to withdraw us from all the daily cares which so often and needlessly perplex us; for the mind cannot at one time be occupied by two objects of sense, or two conceptions, the abiding results of past impressions. Cicero† appears to have had this in his thoughts, and, like Byron, considered "that words are things," since they excite conception,‡—the chief thing

* Mr. Burke, in his well-known letter on the French Revolution, gives the following vivid and truthful description of the cheerless and unprofitable way of life of the purposeless affluent. Some charitable dole is wanting to persons of wealth and rank, our often very unhappy brethren, to fill the gloomy void that reigns in minds which have nothing on earth to hope or fear; something to relieve in the killing langour and over-laboured lassitude of those who have nothing to do; something to excite an appetite to existence in the palled satiety which attends on all pleasures which may be bought.

† Nam cætera neque temporum sunt, &c.

‡ See Note on How Conceptions are Formed.

with which all artists, orators, and both scientific and literary men are most conversant. But Mr. Burke seems to have thought that the pleasure which we derive from poetry at least is not by the conception which words—"sparks of immortality"—excite. From this opinion, sanctioned as it is by so great a man, an appeal may be confidently made to every one's experience, while reading the odes or elegy by Gray, or the plays of Shakspeare. How could a Garrick or a Siddons have given expression to the characters they represented but from conceptions excited by words? Jenny Lind said she could never venture to perform a fresh character till she had formed a vivid conception of its mental individuality. And still there are many who assert that they derive more real pleasure from the conceptions excited by the words of Shakspeare read in solitude than when they were impersonated by the matchless art of a Siddons or a Garrick. But this pleasure was from the exciting effect of a quicker circulation, the revivifying of nervous and muscular excitability, the sources of health? Why? If the purpose of this life be, as reason seems to indicate, a school in which such habits of

intelligence as may prepare the mind for some more advanced state of existence, on this hypothesis it is explicable why such urgent curiosity to know, and to know by doing, should have been given; and when known, why so impatient a desire to communicate to others; for there are often states of ardent excitement, and the acceleration is mostly in accordance with the excited state of the mind. The restoration of Anson's crew, and the garrison of Breda, from scurvy by hope, and from ague by the confiding hope inspired by charms, supply proof of the salutary effects of a moderately excited circulation induced by hope.

Such pursuits cannot be effectively carried out but by the instrumentality of well conditioned organs of sense, by which alone whatever is external to the mind can have access to it. Of the organs of sense, the muscular sense is by far the most important, since it is this which, when any of the other senses are defective, enables the remainder, by attention to their adjustment, to supply their place, and render the mind accessible to as much education as has been given to Laura Bridgeman by the sagacity and persevering atten-

tion of Dr. Howe. Each organ of sense has three nerves. By the first, or specific, the physical force by which each organ may be impressed by all external objects, distant or near, is indicated to the mind. The second is a nerve of muscular sense, by which the adjustments for perceptive search are regulated; and the third is the muscular or motor nerve, by which adjustments of the eye, &c., analogous to those of the telescope, are made for distant vision. That without such adjustments we have not distinct vision any one may satisfy himself by standing with his eyes open before a distant lamp, the moon, or a star, so as to let the light shine into his eye, but without making an effort to look at it, he will then be aware that it is only the subjective image which is perceived by the mind and not the lamp, &c., for the image of the star seems to move vaguely in different directions, though we are sure that the lamp, &c., are stationary.

Now it is by the sensitive and motor branches of the fifth pair of nerves branching over the whole of the scalp (head) and face that all impressions have communication with the medulla oblongata and the brain (the

immediate instrument of the mind). It is therefore clear how essential it is that the apparatus should be kept in a state of health and efficiency. The surest means of effecting this, so far as my experience has enabled me to judge, is to keep the sentient extremities of the nerves and the minute blood-vessels of the head and face free from the contractile pressure of the skin, &c., from the intercepting film formed by perspiration; this may be done by soap, water, a nail-brush, and a rough towel, and should be the care of all who would have a *mens sana in corpore sano*. Of the good effect of cold water so applied, or by a stream from the narrow lip of a jug, I can truly testify. I have seldom found it fail when applied to children suffering from convulsions, and it has afforded immediate relief in all cases of hysteria and epilepsy, and often even when the tendency to apoplexy was imminent, especially if dry cupping was resorted to at the same time.* Every person in the habit of bathing must have been aware of the glow and feeling of buoyant efficiency

* The cold of the water exciting the contractile tissues of the veins, and thus obviating congestion.

which has accompanied the reaction and return of the blood to the surface of the body, and for the effects of an Egyptian bath the Baron Larry, who so long and so ably presided over the medical department of Napoleon's army in all his campaigns, shall speak for himself:—

Parfaitement massé et comme régénéré, on sent un bien-être universel; le sang circule avec facilité, et le jeu de tous les organes se fait sans effort; on éprouve une souplesse, une légèreté jusqu'alors inconnues: il semble que l'on vient de naître et que l'on vit pour la première fois. Un sentiment vif de l'existence se répand jusqu'aux extrémités du corps; tandis qu'il est livré aux plus flatteuses sensations, l'ame qui en a la conscience jouit des plus agréables pensées; l'imagination se promenant sur l'univers qu'elle embellit, voit partout de rians tableaux, partout l'image du bonheur. Si la vie n'est que la succession de nos idées, la rapidité avec laquelle la mémoire les retrace alors, et la vigueur que met l'esprit à en parcourir la chaîne étendue, feraient croire que, dans les deux heures de calme délicieux qui suivent les bains, on vit un grand nombre d'années. Je puis dire avoir ressenti moi-même tous ces effets salutaires. J'en ai vu résulter d'excellens effets, et je ne doute pas que ce moyen, ne contribue pour beaucoup à la longévité de la vie.

About the close of the last century much was written to suggest the perfectibility of man. Perfection, in man's apprehension of the term, cannot be the attribute of more than one being in the universe; but, as much

has been done by culture to improve the condition of plants and animals, and to develop by cunningly-devised coils the physical forces by which all the phenomena external to the mind are manifested, may not means be found so to improve man's mortal coil as to render it more durable and more adjustible and effective. Breeds of sheep, cattle, and horses have been improved, and why not man? The experience of Dr. Howe, in America, and of the Abbé Carton, at Bruges, and of many in this country encourages us to hope that since so much has been done to remedy defective structure in some of our senses by more efficient adjustments of those that remain, which the medical profession has done, and are still doing, with the certification of the improvement, tested by the longer average duration of life, as proved by the lower rates of assurance. The mental and vital functions of man have been extended, and immeasurably, by the discoveries of mathematicians, and by the aid of the coils devised for giving efficiency to the physical forces. By the telescope our vision has been extended; by the steam-engine, locomotion accelerated; and the distance of space

brought near, by the reduction of time. By improvements in the galvanic trough, the immortal discoveries of Œrstad, and the ingenious adaptation of Cook and Wheatstone, thoughts can be transmitted and conversation held with persons thousands of miles distant within a time which twenty years ago would hardly have sufficed to convey a message from Hyde Park to the Bank, so unexpected are the results of well-directed scientific pursuits within little more than a century.

ON THE INFLUENCE OF THE CIRCULATION OF THE BLOOD ON THE MENTAL FUNCTIONS.

This is a practical question, for as the whole body of an animal is a secretion from the blood of its parents, is kept in repair and rendered sensitive and contractile by the blood, and in ratio of its purity, and as all we can know of the external world is by

inference from the subjective sensations impressed on our organs of sense, it is obvious that our knowledge must be dependent on the fitness of the bodily organs for being adjusted by the mind, and receiving impressions from existing objects, analogous to a telescope, which must be adjusted by the mind of the astronomer, and reflective or refractive of the impressions it receives.

Cretins, unfitted for the functions of life by impure air, and insufficient food and filth, are restored by removal to pure air, wholesome food, cleanliness, and exercise. But the result is obviously referable to the agency of the blood: man, therefore, is a coil, secreted by his parents, and actuated by vitality and animated by mind.

I have in former papers, read in this Section, adduced facts to prove that vitality and mind are forces, and in correlation with the physical forces. Alike to these, their manifestation is in ratio of the fitness of their coils. The circulation of the blood is in a real coil of tubes, it is the oxygen of the decarbonized blood which excites the propulsive motion of the heart and arteries. The stimulating effect of the oxygen may be fully

estimated by the pain it excites on an abraded surface or cut, and the suffering of a person recovering from suspended circulation. The nitrous oxide gas is described by Sir H. Davy to have excited feelings of extended touch. It is still the opinion of some persons, that the impulse given to the blood by the heart is the only impulsive force actuating the circulation, but there are facts adduced by the late Sir Charles Bell, to prove that the muscular coat of the minute arteries assist in working the functions of secretions, and that in the instances of tears, saliva from conceptions of food, and many other instances well-known to physiologists, that minute arteries are excited by retransmissions from conceptions.

May not the flow of blood through the capillaries be aided by the electricity evolved from the chemical affinities of oxygen with the carbon?

In the year 1792, while making experiments on frogs and rabbits, and some experiments with zinc and silver suggested by Galvani's then recent discovery, I divided the nerve of one of the legs and tied the crural arteries of the others; the muscles whose

arteries were tied soon lost their contractility, while those whose nerves were divided, but whose arteries were not compressed, were excitable for months after the nerve had been divided. From these facts I inferred that the blood and not the nerves influenced communication by the brain, and was the source of both sensibility and contractility. The frogs were kept in a large pan of water renewed every day, and their skins as little injured as could be avoided; but when the skin was lightly brushed so as to excite the sensitive extremities of its nerves, a blush was seen on its surface, and the muscles were excitable by zinc and silver in contact with the trunk of the nerve and with each other. Now the effect of thinking has an effect on the blood vessels analogous to brushing, in so far as it accelerates the circulation of the blood through them.*

This appeared to me then, as now, a proof that both sensibility and contractility were communicated by the blood analogous, as it now seems, to the sensitiveness communicated to Talbotype paper by chemical pre-

* See Paper on Influence of Circulation of Blood.

paration. May it not be by the blood projected to the eyes of cats, owls, and all animals who seek their prey in the dark, that the retina is rendered sufficiently sensitive to the smallest degree of light?

The late Sir William Herschel says, in one of his astronomical papers, that he always sat in a moderate light, and without moving his eyes, so that the retina might recover its sensibility, before he looked into his telescope. We grope our way from a bright sunshine to a diorama, but all is light when we return, and the sensibility of the retina has been revivified by the blood, and the absence of exhausting light. As it is with the eyes, so I infer that it may be with the brain, the organ employed by the mind to effect the thinking functions.

Blood, says Sir A. Cooper (Guy's Reports), was seen to flush the surface of the brain (perceivable from the loss of a part of the skull and dura mater) with every change of thought, even the most indifferent; and any one may have observed that the scalp is overheated and the brain sensitive of an accelerated circulation in it when the mind has been long and intently thinking, that

with every thought there is a retransmission or projection of blood, not only to the brain, but also to the part whose functions are required for action.

We have proofs in such cases as those described by Dr. Yellowly in the Medical and Chirurgical Transactions, and others, so ably commented on by Sir Henry Holland.

The sensibility communicated by the blood in a like case appears to me the efficient cause of consciousness. I have thus far spoken with reference to the red arterial blood only. The venous black blood injected into the brain by Bichat, destroyed life; and Sir A. Cooper could also suspend all its phænomena by pressure on the carotid and vertebral arteries. Now since all the blood in patients in cholera is black, how is it that their consciousness is not suspended? Mr. Magendie, in his able pamphlet on cholera, says that the intellect of one patient continued clear for more than two hours after the pulse in the wrist had ceased to beat. I asked him how he reconciled this fact with those recorded by Bichat; he answered, "My friend Bichat, if living, would have to write that paper over again." May not the

following aid our conception of two facts so seemingly incompatible? The skull cannot probably contain more blood at one time than at another, but the proportion of the venous blood may be abnormal, and by its congestion and pressure (as the finger on the denuded brain of the beggar) render a patient comatose. In cholera there is no pressure by venous blood, for all the fluid parts of the blood have been discharged from the bowels.

That conceptions are more vivid when we are in such a state of excitement as to accelerate the circulation of the blood in the organs in which conceptions are produced, as in emotions, passions, and intensely pleasurable or painful sensations, cannot but have been noticed by all who can and do give their attention to the operations of their own minds. The painter seems to see on his canvas such a conception of the face he is trying to paint. The lover sees "his mistress where she has not been," and such conceptions are the object of most illusive appearances. Appearances luminous to the eye are evidently from an excited state of the minute arteries of the retina and brain, and I much suspect that the vivid coruscations of

light, said to have been seen issuing from the poles of magnets in the dark, are caused by a like excited state of the minute arteries of the retina and brain.

If Dr. Marshall Hall's great law of excito-motory retransmission may be extended to further retransmission from intelligent conceptions, artistic conceptions, instincts, emotions, passions, and the functional actions of ordinary life, also of dreams and reveries.

These retransmissions are of mental influence to the adjustments of animals; of blood, to give the nerves and muscles of adjustments excitability, sensibility, and contractility; and their immediate direction is limited by the structure of the parts to which the retransmitted influence flows. Hence each expression, each action, whether flowing from instinct or attention, is alike in man or animal in which it occurs.

For watches made alike, go alike. Hence,

> One science only can one genius fit;
> So wide is art, so narrow human wit.

This, perhaps, though unknown to the Jesuits, was the basis on which their system of education was founded. Their experience taught them it was in vain to educate a child

disposed to the practice of one art to become a proficient in another. Addison was a thinker, a writer, and a poet, and born to write, converse, and live with ease; but, though a minister of state, he could never speak in public. Fox spoke without effort, but wrote with difficulty. Hare was a wit, and conversed better than any man of his time; but, with the House of Commons to draw off his attention, never could retain his conceptions long enough to embody them in words. Has he hands? asked Dr. Wollaston, when any man was mentioned to him as a man of promising intelligence.

To educate, therefore, find the propensity of the child, and drill the hand to obey the eye of the painter, sculptor, the musician, and mechanic, the voice and gestures of the actor and the orator. But to insure accurate retransmissions, the conceptions from which they flow must be vivid and well-defined to obtain such conceptions; both objects and their relations to each other must be searched for line by line and angle by angle.

Sir Everard Home put cubes, circles, and triangles before two boys whom he had lately couched, and was surprised to find that their

perception of the difference was not instantaneous, nor until the eye had travelled along each line and marked each angle. Does not this prove that in perception, at least, if not in sensation likewise, the mind is active?

Now is it not probable that by this activity and the consequent minute arterial actions excited by the mind's activity in different parts of the body, by retransmissions, that the continued health of the body may be sustained? The parts of the body thus brought into a state of activity are in accordance with the conceptions from which their retransmitted influence, whether mental or excito-motory, may have passed. Infants, for example, prompted by instinctive curiosity to examine the objects presented to them, have their retransmissions chiefly to their fingers and their lips, in which the sense of touch is most excitable. How sensitive the lips are, not only in infancy, but through the whole of our lives, any one may satisfy himself by the following experiment:—If the points of a pair of compasses or scissors are rather less than a quarter of an inch apart, and you repeatedly touch any part of the cheek with them, they are felt as but one

point ; but, if put astride any part of the lips when closed, they are felt not only as two points, but wider apart than they appear to the eye. The difference in these sensations may probably be from the more numerous distribution of arteries and nerves in the lips than in the cheeks.

Since then, retransmission from conceptions have so important an influence on our well being, both in body and mind, too much attention cannot be given to the formation of conceptions ; and as all conceptions are images impressed by objects or suggested by their relations, the most important lesson we can teach is, how to observe accurately. While learning to sketch objects presented to them children acquire habits of attention, without which neither a correct knowledge of the present nor memory of the past can be expected.

FRAGMENTARY NOTE ON THE EXCITO-MOTORY SYSTEM.

All retransmissions from sensations of touch, hearing, taste, and smell to the adjusting muscles of the eyes to form conceptions are effected without our stir, and independent of our volition, by the excito-motory system, so satisfactorily developed by Sir C. Bell's discovery of the muscular sense and Dr. Marshall Hall's fuller development of the whole system. All our emotions, all our passions, even our memory, by suggestive and associated ideas, by the influence which antecedents have in recalling sequents, even a *verve*, in moments of felicitous thinking, are effected by the excito-motory apparatus. All the phenomena of dreaming, and somnambulism, and sleep talking are effected by this apparatus in the body, independent of the mind. For so little able are we to do any thing of ourselves to help ourselves, that we cannot even by a volition call up a name or an event, however important the recollection of it may be, by any effort of volition,

but it may come uncalled when the time for its use has passed. This apparatus belongs wholely to the spinal chord and medulla oblongata, and is the active agent in the formation of conceptions by communications from all organs of sense through the branches of the fifth pair of nerves to the medulla oblongata. An instance from a competent and truthful person will show how perfectly independent of volition is this excito-motory apparatus as illustrative of its influence on memory in dreams. This gentleman had a brother who frequently talked while asleep, and on being asked if he could conjugate this or that Greek verb, the sleeper would begin and go regularly through it as when awake and repeating it at the desk of his schoolmaster. But distinct as are voluntary phenomena from the excito-motory, they may by due training be substituted for each other; what in the natural order of our intercourse with others is voluntary, may by frequent repetition become so habitual as to have the semblance of an excito-motory fact. As an instance, where we do what at the moment of doing we have no intention of doing, this constitutes the war in our members—we do

what we would not do, and leave undone much that we would do. It is to this source that the phenomena of conscience* are referable. Pope's Eloisa by this process finds the name of her lover already written, even while praying that it never might be revealed.

Strange as it may appear to those who are not fully acquainted with this subject, it is by the excito-motory apparatus, whether of conservation or repair, secretion and excretion, circulation of the blood and respiration, that all the functions of the body are performed, and many functions which are thought to be purely mental, for example, memory, and the formation and duration and re-appearance of our conception; as any one may satisfy himself by the difficulty of recalling a forgotten name. Now as conceptions are the materials of memory, it must be apparent that memory also is worked by the excito-motory structure. By this our emotions and passions, appetites and desires, are worked independent of our will.

* When vivid conceptions of the past recur to reproach us, "Curæ ultrices."—*Virg.* Is the rapid exertions of a musician by such habit, or is a volition in continued action?

HOW CONCEPTIONS ARE FORMED.

I Believe it is Aristotle to whom we are indebted for the first full enumeration of the suggestive circumstances which constitute the association of our ideas, the cause and effect, the time and the place, contrariety and analogy, and, by a pre-established harmony between what is external to us and our organs of sensation, reciprocally recall each other. But how is it with arbitrary and conventional signs of thought? for example, with words and musical notes, how is it that they equally with natural signs recall conception?* The Rev. G. L. Benson, a most respectable member of the Cathedral of Salisbury, and whom I have known from infancy to have an exquisite sensibility to musical sounds, has often told me that he can take up a new opera that he had never heard performed, that while reading the notes he seems to hear every instrument and every voice as distinctly as if he were present in the Opera House during its performance. The physiological process by which both natural and arbitrary signs call up conceptions of things external to the mind, I apprehend to be the following: That whatever is brought to our notice by the same adjustments of the organs of our senses, whether as cause and

* The score and the sounds having been so habitually seen and heard together.

effect, in time and place, &c., recall the adjustment by which they first entered the mind, and with the adjustments recall the objects to which these adjustments are adapted. It is in this way that the blind are taught to associate certain adjustments of the organ of touch with the embossed letters which recall the objects with which in time and place they have always felt them connected. For example the word key, recalls the key which had been felt at the same time with the embossed word. It was by feeling the cat and hearing the word at the same time that Cheselden's blind boy fixed in his mind the distinction between his play fellows the cat and the dog; and it is by long continued drills of this kind that all the arts of life are so formed into habits of instantaneous conception of the thing signified by the presentation of the sign of it to the organs of any of our senses. It is thus that the conception of a man-of-war is excited in the mind of the mariner by the appearance of her distant topmasts and sail; of a Cathedral by its distant and perspective miniature to one who has seen it near.

PLACE OF CONCEPTIONS.

I AM well aware that Sir D. Brewster suggested that our conceptions may not be as Shakspere

wrote, in the mind's eye, but in the body's eye; and probably in the retina. But the following considerations may excite a doubt at least if conceptions may not be formed in the roots of the fifth pair of nerves, in the medulla oblongata, where sensational communications terminate, and where motor retransmissions to functional organs have their starting point: for, as conceptions are the efficient causes of retransmissions of blood for the secretion of tears in emotions of pity and grief; of saliva from conceptions of savoury food; and of motor influence productive of joy, laughter, somnambulism; and all similar instances seem to prove that retransmissions from touch, smell, taste, and hearing, produce visual conceptions of the objects which excited those sensations; and that these conceptions so eclipsed the sensations by which they were excited as to occupy the undivided attention of the mind. While thinking intensely the whole of the head becomes heated, but that must be from the accelerated flow of arterial blood, and thus probably by the influence of motor nerves excited by conceptions at their starting point rather than from the retina. Again, have we not conceptions of the objects of our other organs of sense, "Manent infixi mente vultus verbaque viri," as sounds that are audible to ourselves, as tunes for example, must be clear to all who can recall a tune. Now, can such conceptions of tunes have place in the retina, or even

conceptions of touch, unless by a retransmission to the adjusting muscles of the eye exciting visual conceptions of the object touched:

> The Soldier, fairly proud of war and toil,
> Pants for the triumph of his Nancy's smile;
> But ere the battle should he list her cries,*
> The lover trembles and the hero dies.

when I hear a well-known voice I seem to see the person, and the retransmission has so instantaneously succeeded the touch that it is the visual sensation alone that is remembered.

ON THE STATE OF THE MIND DURING SLEEP.

During sleep the only objects perceived by the mind are the adjustments formed by the Excito-motary apparatus.

What is the state of the vital and mental forces during sleep, dreaming, trance, asphyxia, coma, compression of the brain, intoxication?

The body of an animal is its coil ("mortal coil"),

* Because her cries excite visual conception of her. Conceptions of sight and hearing which have entered the mind at one and the same time, and by the same adjustments recall each other. Dr. Reid thinks that conceptions of touch cannot be re-called, and thus the eclipse of it may possibly be the reason.

and this, like a federative republic, of which the brain coil is the chief, is composed of a congeries of coils (organs of sense, glands, &c.), and, above all, of a muscular apparatus so adjustible as to enable the mental force to form it into coils for occasional purposes,* for expression by speech and gesture, execution of works of art, &c.

In its waking state, the mental force has indirect perception of the adjustments of the muscles by the muscular sense, rendered more sensitive by the blood accompanying every retransmission to the muscular and nervous fibres.

The mental force has, in addition to perception and volition, a power to modify the adjustments induced by sensations and conceptions. It has its sense of buoyancy and fatigue from the different degrees of compression felt on the sentient extremities of the muscular nerves, hence the idea of power. Hume challenged the assertors of our having an idea of power to adduce the impression from which it may be inferred; and here is an adequate impression.

That mind and vitality are forces, is ascertained by the resistance they can oppose to all the physical forces, to those of gravitation and motion, by mounting a hill or swimming against a rapid stream, by the heavier weight sustained by a living

* I have lately heard a band of real musicians who by their voices imitated instrumental sounds, and this by coils formed by the organs of speech (I use the word coil in the same sense in which Œrsted applied it to his Electric magnet.).

than a dead muscle, and by the fracture of bones by falling, without the contact of hard substances. Dead fishes are disintegrated by being frozen; but Sir John Franklin's fish, at Fort Enterprize, were alive when thawed, after having remained frozen thirty-six hours. Men have resisted the effects of temperature which roasted and boiled butchers' meat.

To what source but to mind can we refer the existence and marks of intelligent contrivance on the earth, and in all we have learned of the universe?

It is an indispensable condition of all force to be latent to our faculties till a fit coil is present. We knew but little of motion, heat, light, gravitation, &c., before the watch, steam-engine, thermometer, barometer, &c., were invented; but the presence of the coil ensures the presence of the force, and the more perfect the coil the stronger the force.*

When asleep, our coil is like a drum unbraced, or harp unstrung—unadjusted, whether for sensation or action. But what is its state when we dream? Then some of our organs retain such a state of tension as to be excited by impressions or conceptions, and impressions upon vital coils induce

* The late Mr. Read of Knightsbridge had on the top of his house an electrical apparatus, so excitable that it indicated by bells the slightest change in the electric strata of the atmosphere.

definite adjustments (probably by retransmission). If the lips of a comatose patient be rubbed with a spoon before its contents are put into the mouth, the adjustments of deglutition are so accurately made as not to risk suffocation. It is thus intelligible how suggestive touches induce retransmissive adjustments, by which sleepers, the blind and deaf (feeling by the touch), are enabled to interpret the meaning of others; and questions to persons asleep are suggestive of the adjustments by which they are answered. This is analogous to the suggestive effects of questions in ordinary conversation, but still more palpably of leading questions in courts of justice.

The less the relaxation of tension (as in the morning) the more vivid the dream. Our belief in our dream (as in the diorama) is not contradicted by objects outside.

When conceptions are vivid, such as belong to the passions, they produce retransmissions to the parts to which the conceptions belong.

Again—That the adjustments required for sensation are the same as those by which conceptions are formed, is proved by various cases—by the experiment of Banks*—by the murderer, suffering from remorse, having always the image of his murdered child before him.

* See Banks' (in Dr. Darwin's Zoonomia) report on ocular spectra.

It is contrived by Benevolence, that like adjustments induce like conceptions. Many repetitions are required to form accurate conceptions. And we must *do* to know, for it is not till we have *done* that we get the conceptions which form the painter, sculptor, orator, singer, &c. Sir J. Reynold says, that it was not till he had been at Rome a year, that he began to appreciate the works of Raphael.

We know how vibrations induce definite diagrams. Thus are also definite adjustments induced, and thus identity is recognised, by the likeness of this object to our previous conceptions of it.

Unadjust the coil, and the force disappears. This is the sleep of the coil, not of the force. In man, who is, as we have said, a congeries of coils, they do not *all* sleep.

Feeling in the body, and conception from abiding adjustments of past sensations, are the instructive interpreters of new sensations. Thus the conception of a ship near to us, interprets the perspective appearance of a distant sail. Every known part is suggestive of its whole. A conception already in the mind retransmits such adjustments to the ear, that it interprets the sound of the words sung in music. When I read the words of a chant, I hear them when chanted, not otherwise.*

Some persons seem to live in a dreaming state, unadjusted by attention. They do not observe

* Qui sturtis vigilans nec somnia cernere cessas.—*Lucr.*

what is passing; for we must look to see, listen to hear, &c. Their impressions and conceptions induce no definite adjustments, and adjustments are, to the perceptive mind, signs of thought.

In profound sleep, we are not aware of more than suspension of consciousness, and are without dreams. In what, then, does this differ from death but in time? "Sleep, the death of each day's life." "But in the sleep of death, what dreams may come?" If my notion of this subject be physiologically correct, the mind is a force acting as physical forces do, each through the medium of its appropriate coil, and returning to a latent state when the coil is withdrawn. A force is not manifested when the coil is not, any more than thinking is, when the coil is disconnected with *mind force*. What then becomes of the mind? What becomes of any other force? Motion is individualized in a watch—gravitation in a pendulum—heat in a thermometer—and gravitation again in a barometer—magnetism in a natural or artificial magnet.

Endow appropriate coils with consciousness—as soon as an appropriate coil is presented, the force will, as we observe in all coils, enter it, as in the instance of the coil for atmospheric electricity.

Where, then, is mind, when its mortal coil is perishing in the grave? Where are the physical forces when the instruments which they actuated (the pendulum of a clock, a steam-engine, a voltaic

trough, or a Leyden phial) are broken? Gravitation, motion, heat, and electricity do not cease to exist. They existed before their coils were invented, and will continue to exist when this earth and all material organized structures shall have ceased to exist; and that this will be the condition of the mind, we have abundant reason to expect. It is the mansion, not the tenant that is changed. Mind may still live as distinct from flesh and blood, which is sustained by food, as is the swimmer from the flood.

ON THE RELATIONS OF SENSATION TO THE HIGHER MENTAL PROCESSES.

The author observed that *man*, when viewed as a whole, should be considered as consisting of a body, constituting the instrument of the mind, as the telescope is of the eye, *adjustable* but not *adjusted:* that its indications are perceived through the medium of the *muscular sense*, as the images reflected, or refracted in telescopes are the signs of external objects to the eye. Animals have adjustments ready made: man has to learn his. A man just couched is as unskilled as an infant to see and to touch, even in the common usages of life, much more as an artist; till he can adjust he

sees, as we do with an unadjusted telescope, merely a vague light. This gives rise to *search*. To *see* with intelligence, we must *look*, that is, *exert* the combined adjustments—this constitutes an appreciable distinction between *sensation* and *perception*.* The unadjusted impressions pass the mind as vague trains of thought, linked and associated sequences, the machinery of reveries, and dreams. That searching to obtain well-defined perceptions, is effected by adjustments, attention to our own *working observation* will afford abundant proof; but a more protracted attention is necessary to prove, and to convince *us*, *that our memory* and *powers of conception*, equally depend on the mind's perception of *a reiteration of the adjustments of sensation*. But that this is so, we have proof, in the *fact that the corporeal* actions induced by conception, are similar to those produced by sensation in the presence of the objects. Thus conception of savoury food excites secretion in the salivary glands—the conception of an insult excites the feelings and gestures of anger, &c. In *the power* of forming, and giving fixity of tenure to conceptions men differ widely. It is to this power Dr. Johnson alludes, when, in his Tour to the Hebrides, he says, that whatever can make the past, the distant, and the future prevail over the

* While searching for Neptune
A was told (of its whereabouts) but did not believe;
B beheld, but did not perceive.

present, raises us in the scale of thinking beings. Now Dr. Darwin and Sir David Brewster have shown that these conceptions are effected by adjustments of the body; in other words, that the "mind's eye" is, in fact, the body's eye. To have vivid conceptions disposable by our volition, forms the orator, the poet, the sculptor, and the painter. After illustrating this faculty by numerous examples, and by allusions to it quoted from various poets, the author stated that these sensations, perceptions, and conceptions, do not exist in an insulated state; the adjustments by which they are effected are so linked and associated by retransmissions through the brain to the other organs of sense, that they reciprocally call up each other. This *linked association of adjustments* he supposed to be the machinery by which the *association of our ideas* is effected, and *the propensity of our structure to these functional adjustments to constitute all we have* of *ideas* which had been denominated *innate*. He considered that this reciprocating perception from different sources of sensation (as the eye and ear) gave birth to the ideal theory of "species, images of forms, and colour, of things without their matter," of the old metaphysicians. The author contended that Mr. Hume's opinion on the non-existence of the idea of power, and of cause and effect (except as antecedent and consequent), and the arguments and facts adduced against that opinion, receive an elu-

cidation from the consideration of the modes of action of the muscular sense, of which neither Mr. Hume nor his critics could at that time have been apprised, as the discovery had not been completed.

Yet these impressions (our guides in all corporeal exertions) belong alike to men and all inferior animals, and must have *existed at all times, and in all* places where muscular exertions have occurred. *But the law of sensation is such*, that the mind passes this muscular feeling unnoticed, and attends solely to its perception of the object by which the sensation was excited. Thus the attention of the seamen who heaves the lead is directed only to the contact of the lead when it touches the bottom. Every boy who throws a stone, every horse on *his approach to a leap, estimates his power by these* feelings, although thinking at the time only of the distant *object of his aim.* Any man capable of making his sensations the subject of his thoughts, may satisfy himself that our ideas of cause and power have their source in these and like evanescent muscular feelings or impressions.

The Author suggested that it is also from similar feelings of muscular power, recognised from day to day to be the same which we have felt from our earlier years, that we are assured of the continuance of our personal identity.

As regards institutions, laws, and inanimate things, identity consists not in external appearances, *nor in the materials of which they are formed.*

Gunpowder, for example, is not identified by the charcoal, the sulphur, and the nitrate of potass, but by the definite proportions of these ingredients. So it is the peculiarity of any given specified piece of machinery, be it a ship, a chronometer, or a steam-engine, *which constitutes its individuality, and secures its* patent. And Napoleon was quite correct when he told his Senate, that it was not the wood, the velvet, *nor even the crown which constituted* his throne, and right of sovereignty, but that it was the mind of France, of which he alone was the representative, *which ought to be considered by them* as identically France.

The identity of our notion of a triangle does not vary with its various forms, but is fixed and defined by its three angles being invariably equal to two right angles. *The Author therefore considered the essential quality of identity to be* some fixed and permanent mental conception, rather than the outward materials in which it is embodied.

EARLY DEATH OF THE BLIND AND DEAF AND DUMB.

I have found from many Institutions for the Blind and the Dumb which I have visited, in England, Ireland, and on the Continent, a large

proportion of the children die in a few years after leaving the asylum. The cause may be the insufficiency of the quantity of the air respired to decarbonize the blood. Of the 300 cubic inches of air which the lungs of an adult on an average may contain, not more is changed by each passive respiration than about 20; but by energetic speaking and exercise, the chest is more expanded, and a larger volume of air is inspired, and thus (by the diffusion of gases) suffices to supply the quantity of oxygen required. If, therefore, both were taught to speak and declaim or sing in the open air, and run and play unrestrained on uneven ground, might not life be prolonged?

FUTURE STATE.

As nothing has been found more conducive to a healthy state both of body and mind than an assurance of the continuance of sufficiency of income for all the wants of life, so nothing is more likely to be conducive to longevity than just notions of the attributes of the Deity and the relations which we bear to him both in our present state and in a possible future.

In addition to the information which we have on this subject from a higher source, the following

considerations have some claim to our attention. A sensible and good man does not act without a purpose, and all the conception we can form of our Creator is by extending the attributes of the good and the wise to infinity and eternity. Is it then likely that such a being would create others for any purpose but the extension of happiness. But in this life there is much of unhappiness—much of what we call evil. But in the greater number of such cases the unhappiness arising from it is clearly attributable to some misconduct on our part. But error and misconduct are equally unavoidable while we are learners in any of the necessary or ornamental arts of life. It would be unreasonable then to expect that the art by which life is to be conducted should be attainable without the commission of innumerable errors. Non voluit, &c.*

There are evils which appear inevitable by any thing we can do to avert them, but which have still this good effect that they impel to search and contrivance, and thus exercise our minds, so that the improved intelligence acquired in this school of conduct may compensate for any inconvenience which the evil may have occasioned. The old man's sons who were induced to dig the field for the treasure which he told them was hidden there,

* Pater ipse colendi
Haud facilem esse viam voluit, primusque per artem
Movit agros, curis acuens mortalia corda.

were amply compensated by the crop which the digging enabled the field to produce. "Search and ye shall find, knock and it shall be opened to you."

The alchymists, whose poverty induced them to search for the philosopher's stone, and the conversion of grosser substances to gold, laid the foundation of the chemistry by which all arts have been advanced, and to which we owe much of the comforts and all the power to resist aggression which we now possess.

Want is often the muse of the poet, and the patron of the indigent, by the energy which it necessitates, for necessity is the mother of invention.

Man in his savage state has to provide by efforts of mind the shelter and food which inferior animals have provided for them by their Creator.

Even insult, the severest evil with the exception of remorse which the mind of man can sustain, impels to the exertion required by the degradation which the insult had occasioned; and it was perhaps this motive which urged Lord Bacon to rebound from the lowest to the highest condition which man is capable of attaining.*

Solitude is, to many, an evil,† but solitude is, says Gibbon, the school of genius.

* "Injuries," says Junius, "may be atoned for and forgiven, but insults admit of no compensation; they degrade the mind in its own esteem and force it to recover its level by revenge."

† While I was with the British Association at Cork I visited the Asylum for Lunatics, and was told that the most numerous

It may be doubted if the preacher of Mecca and the conqueror of Arabia would have been the prophet of believing millions if he had not first been the solitary of Mount Hera. Nor would that master-mind have been the Regenerator of France, the Arbiter of Europe, and the protector of independent nations, had he not been the solitary prisoner of Ham.

While in solitude we become indifferent to the objects around us. We are impelled by the innate restlessness of the mind to be more conversant with our conceptions and to search among their aried relations to effect some purpose prospective to some future good that may suffice to eclipse the present evil. It is thus by solitude we are schooled to the acquisition of intelligence and benevolence.

> "Away then with folly's idle brood,
> And leave us leisure to be wise and good."

class of patients next to that occasioned by habits of intoxication was that excited by the emigration of relatives. This bereavement left many aged and uneducated persons without the social resources of a comfortable home, and the conceptions which a cultivated mind might have substituted.

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